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GLOSSARY OF TERMS RELATING TO AGRICULTURAL TRACTORS AND POWER TILLERS

(First Reprint SEPTEMBER 1998)

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NEW DELHI 110002

Gr 5 *April* 1982

Indian Standard

GLOSSARY OF TERMS RELATING TO AGRICULTURAL TRACTORS AND POWER TILLERS

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AMENDMENT NO. 1 OCTOBER 2007
TO
IS 9939 : 1981 GLOSSARY OF TERMS RELATING TO AGRICULTURAL TRACTORS AND POWER TILLERS

(*Page* 19, *clause* **11.2**) — Substitute the following for the existing text:

'An agricultural machinery used for soil preparation having a single axle in which the direction of travel and its control during field operation is performed by the operator. The equipment may be walk-behind or riding attachment type and when coupled to a trailer, can be used for transportation of goods. The maximum speed of the power tiller when coupled to a trailer shall not exceed 22 km/h. The maximum haulage capacity of the power tiller coupled to a trailer shall not exceed 1.5 tons.'

(FAD 11)

Reprography Unit, BIS, New Delhi, India

Indian Standard

GLOSSARY OF TERMS RELATING TO AGRICULTURAL TRACTORS AND POWER TILLERS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 31 August 1981, after the draft finalized by the Agricultural Tractors and Power Tillers Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 With the increasing use of tractors and power tillers in the country, a need was felt to prepare comprehensive glossary of terms, incorporating authentic definitions of the terms. This standard is intended to fulfil this long felt need.

0.3 In preparation of this standard, assistance has been derived from the following:

ISO/DIS 3339/I Agricultural tractors and machinery classification and terminology Part I : Agricultural power units. International Organization for Standardization

BS 2468-1963 Glossary of terms relating to agricultural machinery and implements British Standards Institution

ASAE R 296-1966 Uniform terminology for traction of agricultural tractors, self-propelled implements and other traction and transport devices. American Society of Agricultural Engineers. USA.

1. SCOPE

1.1 This standard covers definitions of the terms related with agricultural tractors and power tillers

2. TERMS RELATING TO COMPONENTS

2.1 Belt Pulley — A pulley driven by a power unit to transmit power to another machine or machines by means of a belt

2.2 Breakaway Hydraulic Coupling — A quick-release hydraulic coupling, incorporating automatic disconnection as a safety device

2.3 Cage Wheel — A wheel or an attachment to a wheel with spaced cross-bars for reducing ground pressure and/or improving traction of a tractor or power tiller, generally used in wet-land seed-bed preparation (*see* Fig. 1).

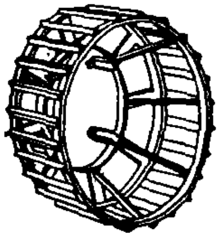

FIG. 1

2.4 Cage Wheel, Half — A cage wheel which is used in conjunction with pneumatic wheel.

2.5 Cleat — A flat or angle strip fitted to the rim of a steel wheel.

2.6 Cleated Wheel — A steel wheel fitted with cleats.

2.7 Differential — A device to enable two wheels, driven from a single shaft, to rotate at different speeds

2.8 Differential Lock — A device when engaged would permit two driven wheels on two separate shafts to rotate at the same speed with a common drive member.

2.9 Drawbar — A member fitted to a tractor through which the pulling force to an implement or trailer is applied. It may be swinging or fixed type and may be adjustable.

2.10 Extension Rim — A rim with lugs or cleats, fitted to the side of a steel driving wheel.

2.11 Final Drive — A device provided for additional reduction of speed between the drive shaft from the transmission and the axle connecting the drive member.

2.12 Girdle — A traction aid with a series of strakes which are connected together by a chain or chains or an articulated frame (*see* Fig. 2).

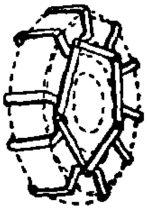

FIG. 2

2.13 Grass Stud — A round pyramid-headed bolt fitted to a steel driving wheel in place of a lug or cleat.

2.14 Grouser — A transverse strake, incorporated in or attachable to a track, to assist adhesion between the track and the ground.

2.15 Hydraulic Power Lift — A mechanism driven by a tractor's power unit to raise, hold or lower mounted or semi-mounted equipment by hydraulic means.

2.16 Main Transmission — A combination of gears and shafts to transmit the power from the engine of a tractor to its wheels or tracks.

2.17 Pick-Up Hitch — A hitch, operated by a power lift, for connecting the drawbar of a trailer or machine to a tractor.

2.18 Pneumatic Tyred Wheel — A wheel fitted with a pneumatic tyre.

2.19 Power-Lift — A mechanism driven by a tractor's power unit to raise or lower mounted or semi-mounted equipment.

2.20 Power Take-Off — A shaft, usually externally splined, to transmit torsional power to another machine. It is abbreviated as PTO (*see* Fig 3)

2.21 Power Take-Off Cover — A protective cap enclosing a power take-off (*see* Fig. 3).

2.22 Power Take-Off Shield — A rigid guard fitted on a tractor, covering the tractor power take-off as a safety device (*see* Fig. 3)

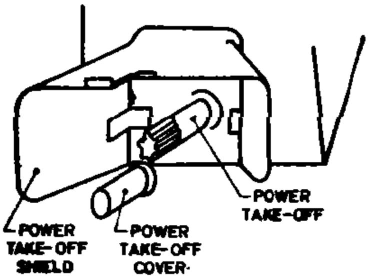

FIG. 3

2.23 Quick-Release Hydraulic Coupling — A self-sealing coupling providing quick connection and disconnection of a tractor-to-implement hydraulic pipeline.

2.24 Road Band — A rim fitted to a steel wheel to prevent contact of the lugs or cleats with the road surface.

2.25 Road Plates — Plates with a flat surface fitted to a track to prevent contact of the grousers with the ground.

2.26 Skeleton Wheel — A steel wheel to give a minimum ground contact area (*see* Fig. 4).

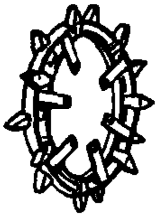

FIG. 4

2.27 Skid Ring — A circumferential flange on the rim of a front wheel.

2.28 Spade Lug — A wedge-shaped metal projection fitted to the rim of a steel wheel.

2.29 Steel Wheel — A wheel made of steel generally fitted with spade lugs or cleats.

2.30 Strakes — An assembly of metal lugs or cleats attached to a pneumatic tyred wheel.

2.31 Three-Point Linkage — A combination of one upper link and two lower links, each articulated to the tractor and the implement at their ends, to connect the implement to the tractor (*see* Fig. 5).

NOTE — For other terms related to three-point linkage, the definitions given in 2.2 to 2.26 of IS : 4468-1977* may be seen.

2.31.1 *Three-Point Linkage Check Chain* — A chain connected between each lower link and the tractor to control the lateral movement of mounted equipment (*see* Fig. 5).

2.31.2 *Three-Point Linkage Stabilizer* — A link connected between ends of one or both lower links and the tractor to hold mounted equipment in fixed lateral position in relation to the tractor.

2.32 Track — A series of jointed track links or a flexible band forming an endless weight carrying rail to transmit and drive to the ground.

2.33 Variable Speed Governor — A mechanism to maintain the speed of a power unit at any selected value within a given range.

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*Dimensions for three-point linkage of agricultural wheeled tractors (*first revision*).

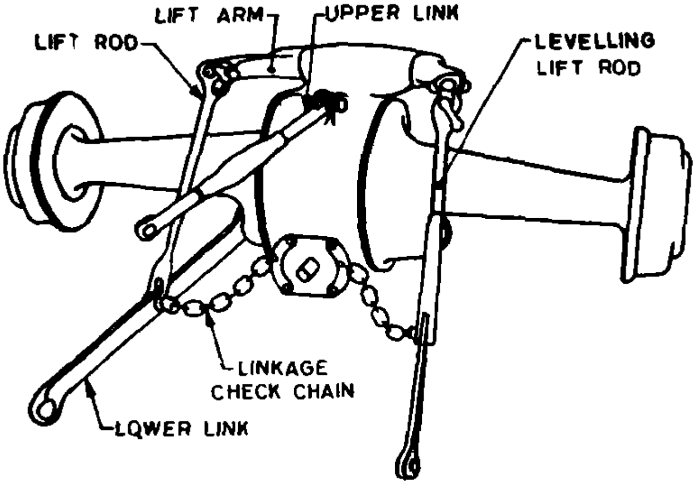

FIG. 5

3. TERMS RELATING TO DIMENSIONS

3.1 Ground Clearance

3.1.1 *Ground Clearance of Power Tiller* — The height of the lowest point of the power tiller chassis from a firm horizontal supporting surface (*see E* in Fig. 6).

3.1.2 *Ground Clearance of Tractor* — The height of the lowest point of the tractor chassis from a firm horizontal supporting surface, the tractor being ballasted as used for drawbar test (*see E* in Fig. 7)

3.2 Height

3.2.1 *Height of Power Tiller* — The distance between a firm horizontal supporting surface and the horizontal plane touching the uppermost part of the power tiller with the engine in horizontal position (*see D* in Fig. 6).

3.2.2 *Height of Tractor* — The distance between a firm horizontal supporting surface and the horizontal plane touching the uppermost part of the tractor (*see D* in Fig. 7).

3.3 Length — The distance between two vertical planes at right angles to the median plane of the power unit and touching its front and rear extremeties (*see B* in Fig. 6 and 7 for power tiller and tractor respectively).

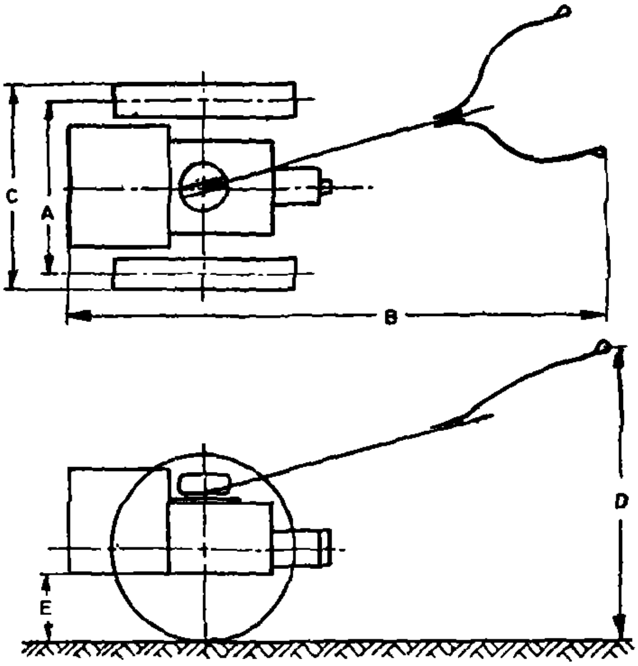

FIG. 6

NOTE 1 — All components of the power unit, in particular of those projecting at the front or rear, are contained between these two planes.

NOTE 2 — Removable hitch components at the front and the rear are not included in the length.

NOTE 3 — Length should be measured when the power unit is stationary.

3.4 Minimum Clearance Diameter — The diameter of the smallest circle described by the outermost point of the projections of the tractor while executing its sharpest practical turn (*see* Fig. 8).

3.5 Minimum Turning Diameter — The diameter of the circular path described by the centre of tyre of the outermost wheel of the tractor while executing its sharpest practical turn (*see* Fig. 8).

3.6 Track (Tread)

3.6.1 *Track of Power Tiller* — The distance at the ground level between the median planes of the wheels on the same axle at stationary position and with the wheels in position for travelling in a straight line (*see A* in Fig. 6).

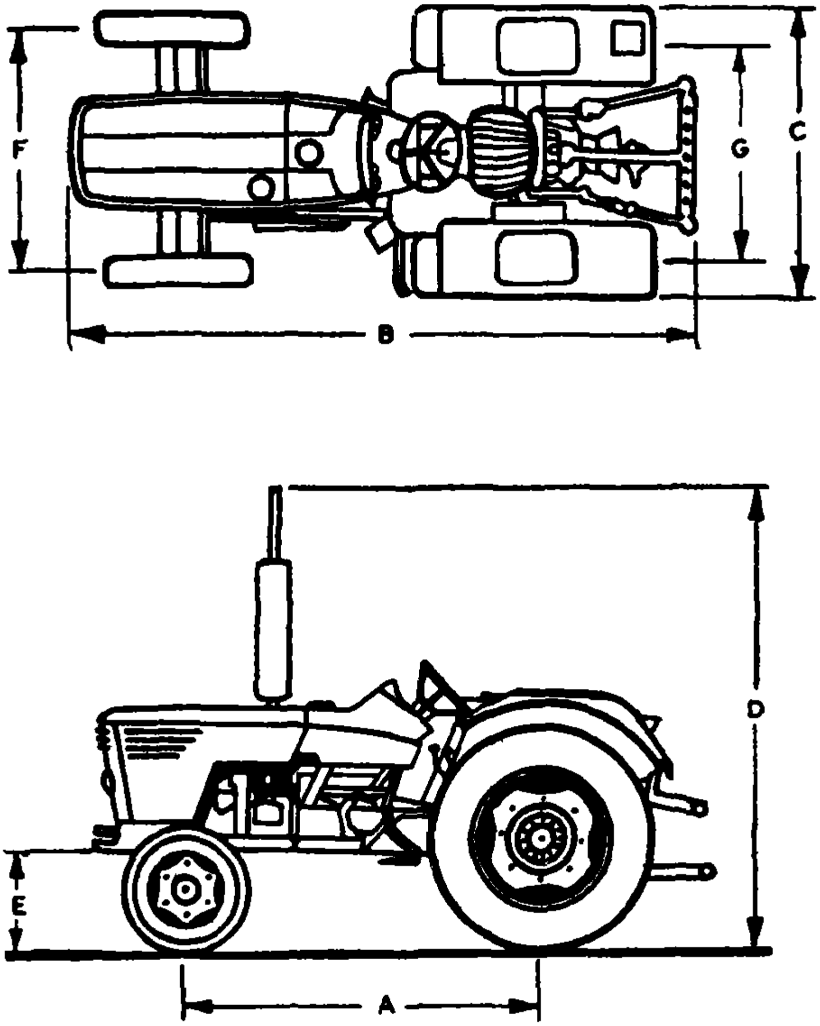

FIG. 7

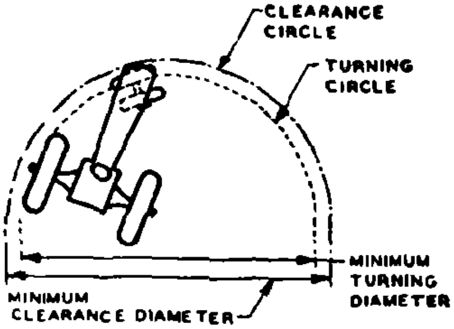

FIG. 8

3.6.2 *Track of Track-Laying Tractor* — The distance between the median planes of the track plates.

NOTE — The median plane of the wheel or track assembly is equidistant from the two planes containing the periphery of the rims or the track plates respectively at their outer edges.

3.6.3 *Track of Wheeled Tractor* — The distance at the ground level between the median planes of the wheels on the same axle of the tractor when stationary and with the wheels in position for travelling in a straight line. The track may be thus defined both for front and rear wheels. In case of twin wheels, the track shall be taken as the distance between two planes, each being the median plane of the pairs of wheels (*see F* and *G* in *Fig.* 7).

3.7 Wheel Base — The horizontal distance between the front and the rear wheels in the same plane measured at the centre of their ground contact (*see A* in Fig. 7).

3.8 Width — The distance between two vertical planes parallel to the median plane of the power unit, each plane touching the outermost point of the power unit on its respective side (*see C* in Fig. 6 and Fig. 7 for power tiller and tractor respectively).

NOTE 1 — All parts of the power unit, in particular all fixed components projecting laterally (that is, wheel hubs, tyres, axle shafts), are contained between these two planes.

NOTE 2 — Removable attachments, like cage wheels, are not included in the width.

NOTE 3 — Width should be measured when the power unit is stationary.

4. TERMS RELATING TO MASS

4.1 Dry Mass of Tractor — The mass of the tractor fitted with all components necessary for its operation, but without water, fuel, oil and operator.

NOTE — Any accessory fitted and its mass should also be stated.

4.2 Operational Mass of Tractor — The mass of the tractor in normal working condition with fuel tank and radiator full, lubricants, etc, filled to the specified levels and the mass of the driver (assumed to be 75 kg).

NOTE — Any accessory fitted and its mass should also be stated

5. TERMS RELATING TO POWER

5.1 Belt Power — Power transmitted through a belt with the governor control in the position recommended by the tractor manufacturer for belt-pulley work.

5.2 Drawbar Power — Power obtained at the drawbar with the governor control in the position recommended by the tractor manufacturer for drawbar work and the tractor moving on a horizontal surface, with the drawbar pull applied horizontally.

5.3 Engine Power — Power measured at the crank shaft of the engine with the governor control lever in the position recommended by the manufacturer.

NOTE — The engine should be fitted with all the accessories required for continuous operation, these should be set in the same relative position as when fitted in the tractor.

5.4 Maximum Drawbar Pull — The maximum horizontal drawbar pull at a drawbar height recommended by the manufacturer which a tractor is able to sustain in the line of its longitudinal axis.

5.5 Power Outlet — Any outlet which transmits the engine power to the tractor in order to make it functional, such as PTO, belt pulley and drawbar.

5.6 PTO Power — Power obtained at the main PTO with the governor control in position recommended by the tractor manufacturer for PTO work, the tractor being stationary.

5.7 Pulley Power — Power measured by coupling the pulley shaft directly to the dynamometer with the governor control in the position recommended by the tractor manufacturer for pulley work.

5.8 Specific Fuel Consumption — The mass of the fuel consumed per unit of work.

6. TERMS RELATING TO POWER TAKE-OFF CONNECTIONS

6.1 Male Shaft and Female Shaft — Male and female members respectively of a sliding assembly (*see* Fig. 9).

6.2 Male Shaft Yoke and Female Shaft Yoke — Yokes attached to the male and female shaft respectively (*see* Fig. 9).

6.3 Power Input Connection — An externally keywayed, splined or drilled stub shaft on a machine (*see* Fig. 9). It is abbreviated as PIC.

6.4 Power Input Connection Shield — A rigid guard fitted on a machine, shielding the power input connection (*see* Fig. 9)

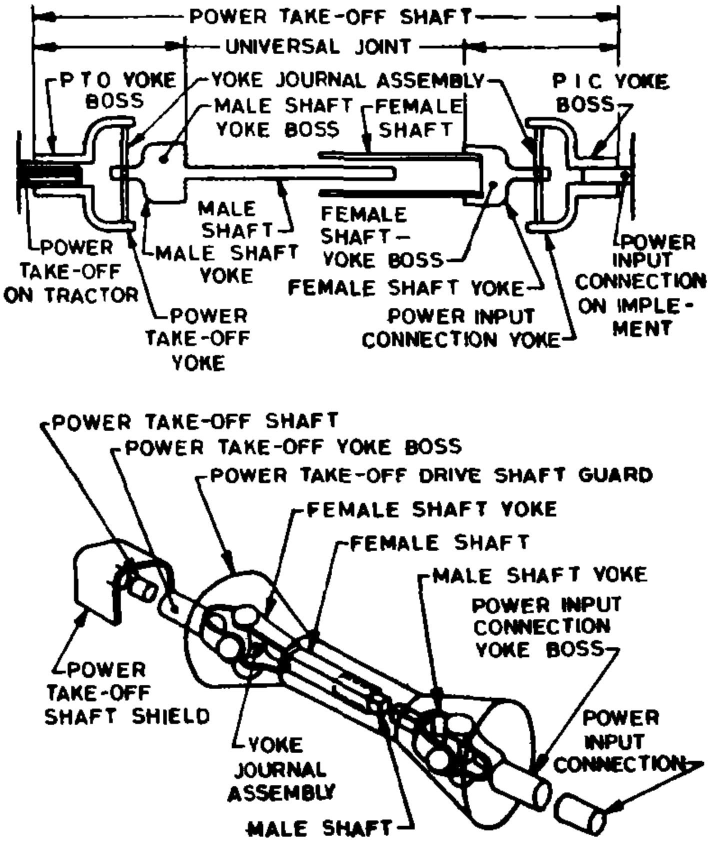

FIG. 9

6.5 Power Input Connection Yoke Boss — An internally keywayed, splined or drilled member which receives a power input connection.

6.6 Power Take-Off and Power Input Connection Yoke — The components which include power take-off and power input connection yoke bosses respectively or, in an appropriate context, a yoke itself (*see* Fig. 9).

6.7 Power Take-Off Drive Shaft — The assembly from power take-off yoke boss to power input connection yoke boss (inclusive) (*see* Fig 9).

6.8 Power Take-Off Drive Shaft Guard — A safety guard fitted over a power take-off drive shaft (*see* Fig. 9).

6.9 Power Take-Off Yoke Boss — An internally splined member which receives a power take-off (*see* Fig. 9)

6.10 Universal Joint — A combination of two yokes and a yoke journal assembly (*see* Fig. 9).

6.11 Yoke Journal Assembly —An assembly which couples two yokes.

7. TERMS RELATING TO REAR TYRES

7.1 Conventional Ply Tyre — A tyre in which the cords of the body plies run diagonally from bead to bead.

7.2 End of Lug Clearance — Distance from trailing side of a lug to end of the lug that follows (*see* Fig. 10).

7.3 Inflation Pressure — For air filled tyres, it is the gauge pressure measured with the valve in any position. For tyres containing liquid, it is the gauge pressure measured with the valve in the bottom position.

7.4 Lug Angle — The angle between the centre line of the lug face and the centre line of the tyre (*see* Fig. 10).

7.5 Lug Base — The projected thickness or width of the lug at the points where the projected planes of the leading and trailing sides meet the projected undertread face (*see* Fig. 10).

7.6 Lug Face — The outermost surface of the lug (*see* Fig. 10).

7.7 Lug Fillet — The curved section which blends the lug sides into the undertread face (*see* Fig. 10).

7.8 Lug Height — Distance measured from the undertread face to the lug face (*see* Fig. 10).

7.9 Lug Length — Distance measured from end to end along the centre line of the lug face (*see* Fig. 10).

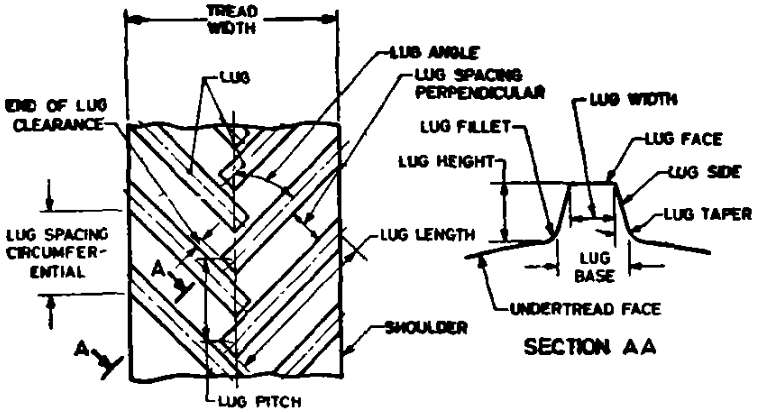

FIG. 10

7.10 Lug Pitch — Centre to centre spacing of lugs on one side at the centre line of the tyre. It is measured at the lug face (*see* Fig. 10).

7.11 Lug Side — The lug surface between the undertread face and the lug face (*see* Fig 10).

7.12 Lug Spacing, Circumferential — The distance from the leading side of a lug to the trailing side of the lug ahead of it, measured parallel to the centre line of the tyre (*see* Fig. 10).

7.13 Lug Spacing, Perpendicular — The distance, measured perpendicularly, from the leading side of a lug to the trailing side of the lug ahead of it (*see* Fig. 10).

7.14 Lug Taper — The angle the lug side makes with a line parallel to the radius that extends from the centre line of the lug to the centre line of the wheel (*see* Fig. 10).

7.15 Lug Width — Width of lug face measured perpendicularly to the centre line of the lug face (*see* Fig. 10).

7.16 Ply Rating — Identification of a given tyre with its maximum recommended load when used in a specific type of service. It is an index of the strength and does not necessarily represent the number of cord plies in the tyre.

7.17 Tread Width — The distance from shoulder to shoulder of a lug (*see* Fig. 10).

7.18 Undertread Face The outermost surface of the rubber on the carcass where no lugs are located (*see* Fig. 10).

8. TERMS RELATING TO SPEED

8.1 Rated Engine Speed — The speed of the engine in rev/min, specified by the manufacturer for continuous operation at full load.

NOTE — There may be one or more speeds recommended by the manufacturer for various power outlets and for specified uses of the tractor or power tiller.

8.2 Theoretical Travelling Speed — The speed of the tractor determined at the rated engine speed for drawbar use, having regard to the total gear ratio and the effective radius of the driving wheels or tracks.

NOTE — In the case of wheeled tractors, the tractor shall be under its own operational mass (without extra ballast), the tyre pressure as recommended by the manufacture for field work, and the tyre lugs not worn more than 1/3 of its normal height

9. TERMS RELATING TO TRACK-TYPE TRACTION DEVICE

9.1 Angle of Approach — The angle between the ground and the section of track between the front bogie wheel and the front idler or sprocket (*see* Fig. 11).

9.2 Angle of Departure — The angle between the ground and the section of track between the rear bogie wheel and the rear idler or sprocket (*see* Fig. 11).

9.3 Grouser Height — Vertical distance from the track shoe face to tip of the grouser (*see* Fig. 11).

9.4 Grouser Width — Overall width of the grouser (*see* Fig. 11).

9.5 Grouser Spacing or Pitch — The distance between corresponding points on adjacent grousers (*see* Fig. 11).

9.6 Nominal Ground Contact Length — The horizontal distance between the centre of the drive sprocket and the front idler (*see* Fig. 11).

9.7 Track Pitch — Distance between corresponding points on adjacent track shoes. (On band tracks, it is the distance between corresponding points on adjacent drive lugs) (*see* Fig. 11).

9.8 Track Width — Overall width of an individual track (*see* Fig. 11).

10. TERMS RELATING TO TRACTION

10.1 Ballast — Any mass that can be added or removed from a tractor for the purpose of changing traction and stability.

10.2 Co-efficients of Traction — Ratio of the total force output of the traction device in the direction of travel to the dynamic weight (normal force) on the traction device.

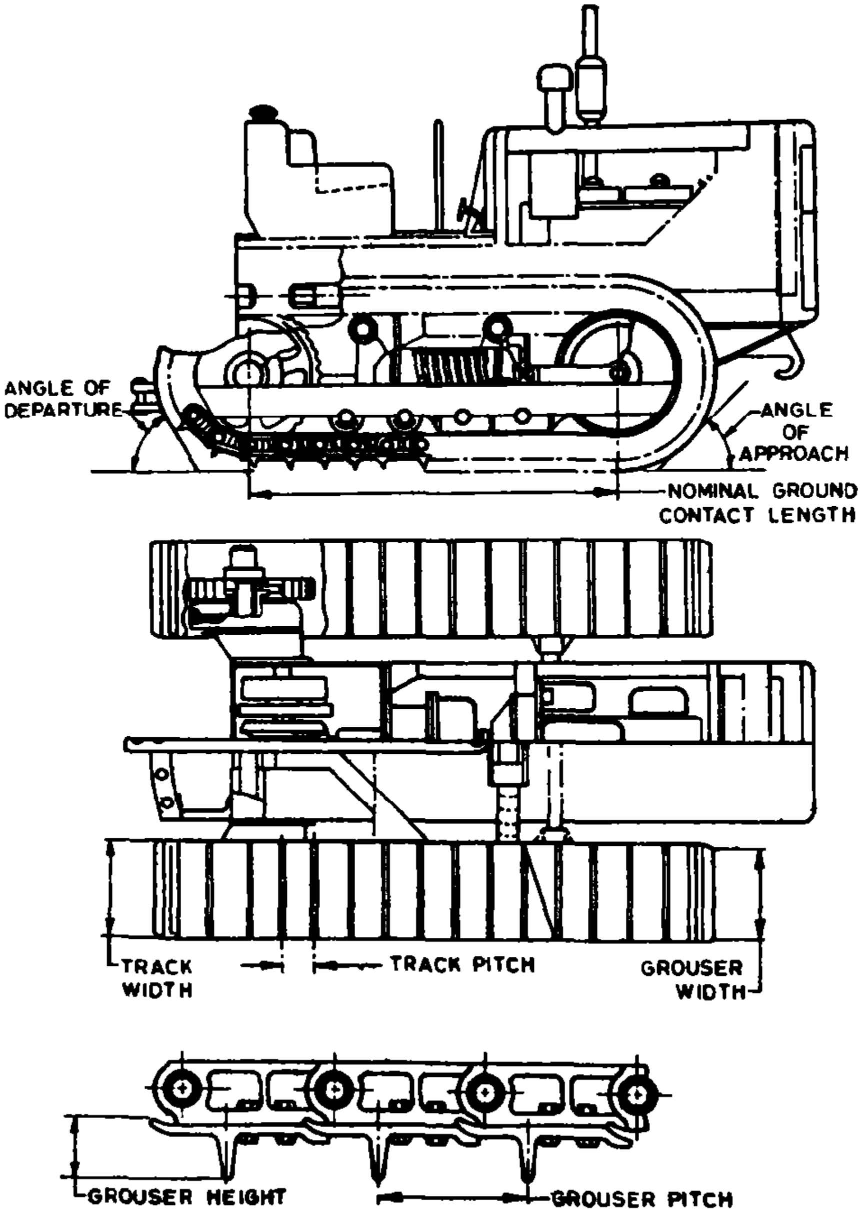
ANGLE OF DEPARTURE
ANGLE OF APPROACH
NOMINAL GROUND CONTACT LENGTH
TRACK WIDTH
TRACK PITCH
GROUSER WIDTH
GROUSER HEIGHT
GROUSER PITCH

Fig. 11

10.3 Coefficient of Vehicle Traction — Same as gross traction ratio (*see* **10.17**).

10.4 Efficiency, Tractive — Output power divided by input power, usually expressed in percent

10.5 Floatation — Ability of the traction device to resist sinkage into the medium being traversed.

10.6 Power, Input — Power input to traction device calculated from input torque and angular velocity of the driving axle.

10.7 Power, Output — Power output of a traction device calculated from net traction force and velocity in the direction of motion.

10.8 Rolling Circumference, Zero-Pull — Distance travelled per revolution of the traction device with only enough input torque to overcome the rolling resistance.

10.9 Rolling Circumference, Zero-Torque — Distance travelled per revolution of the traction device when being towed and with no torque between it and the axle.

10.10 Rolling Resistance of Non-driving Wheels — Force required, in the direction of travel, to overcome motion resistance of the non-driving wheels or transport device.

10.11 Slip — Relative movement in the direction of travel at the mutual contact surface of the traction device and the surface which supports it.

10.12 Thrust — Net traction plus rolling resistance of traction device while pulling

10.13 Torque, Input — The moment measured between the driving axle and the traction device

10.14 Traction Device — A device for propelling a vehicle using the reaction forces from the supporting surface.

10.15 Traction, Net — Force in direction of travel developed by the traction device and transferred to the vehicle.

10.16 Traction Ratio, Dynamic — Ratio of drawbar pull to actual force on traction device normal to traction surface while pulling.

10.17 Traction Ratio, Gross — Ratio of drawbar pull to total weight of vehicle.

10.18 Travel Ratio — Ratio of distance travelled per revolution of the traction device while pulling to the distance travelled per revolution of the traction device with zero drawbar pull of vehicle or zero net traction of traction device only.

10.19 Travel Reduction — One (1) minus travel ratio.

10.20 Weight, Dynamic — Total force exerted by the traction device normal to the supporting surface under operating conditions

10.21 Weight, Static — Total vertical force exerted by the traction device when stationary, on a level surface, and with zero drawbar pull.

10.22 Weight Transfer — The change in normal forces on the supporting devices (traction and transporting) on a vehicle under operating conditions, as compared to a static vehicle on a level surface.

11. TERMS RELATING TO TYPES OF TRACTORS

11.1 Agricultural Tractor — A self-propelled wheeled vehicle having two axles, or a track-laying or semi-track-laying machine, more particularly designed to pull, push, carry and operate implements and machines used for agricultural work (including forestry work) .

11.1.1 *Semi-track Laying Tractor* — A tractor in which the means of propulsion in rear consist of an endless track(s) passing round the driving wheel(s) and the pinion(s) and the front wheels consist of pneumatic tyres.

11.1.2 *Track-Laying Tractor* — A tractor in which the means of propulsion consist of an endless track(s) passing round the driving wheel(s) and the pinion(s)

11.1.3 *Wheeled Tractor* — An agricultural tractor, with at least two axles, the means of propulsion of which consist of wheels generally fitted with pneumatic tyres

11.1.3.1 *Hillside tractor*— A wheeled tractor equipped with manual or automatic means of compensating for sloping ground

11.1.3.2 *Self-propelled tool carrier* — A wheeled tractor which, apart from the work it is able to accomplish with implements placed behind or in front, is adapted and designed primarily for working with rigid full-width implements mounted between the axles.

11.1.3.3 *Standard Tractor* — A wheeled tractor adapted and designed, more particularly by its construction, for working with implements and machines fixed behind or in front and interchangeable.

i) *Standard tractor with four-wheel drive* — A standard tractor whose engine power is transmitted to the ground both by the rear and the front wheels. The rear and the front wheels need not be of the same diameter.

ii) *Standard tractor with rear-wheel drive* — A standard tractor whose engine power is transmitted to the ground exclusively by the rear driving wheels

11.1.3.4 *Tricycle tractor* — A wheeled tractor which is supported on three or four wheels with both front or rear wheels placed very close.

11.1.3.5 *Wasp-waisted tractor* — A wheeled tractor which, depending on its type of construction, is not only suitable for working with implements and machines at front and rear but is also designed to operate under-slung implements.

11.2 Power Tiller — A prime mover in which direction of travel and its control for field operation is performed by the operator walking behind it. It is also known as hand or walking type tractor.

NOTE — Power tillers may be provided with the attachment for riding

11.2.1 *Track-Laying Power Tiller* — A power tiller propelled by tracks passing around the drive sprocket (*see* Fig. 12).

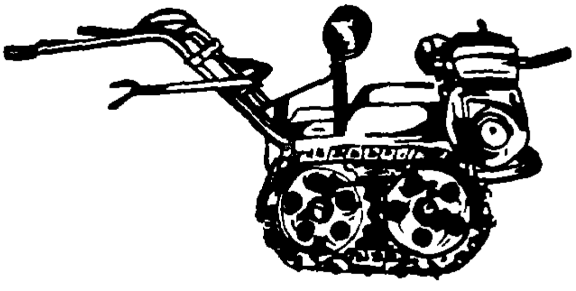

FIG. 12

11.2.2 *Wheeled Power Tiller* — A power tiller propelled by wheels fitted with pneumatic tyres.

11.2.2.1 *Single-wheel power tiller*— A wheeled power tiller with one driving wheel (*see* Fig. 13).

11.2.2.2 *Two-wheel power tiller* — A wheeled power tiller with two driving wheels (*see* Fig. 14).

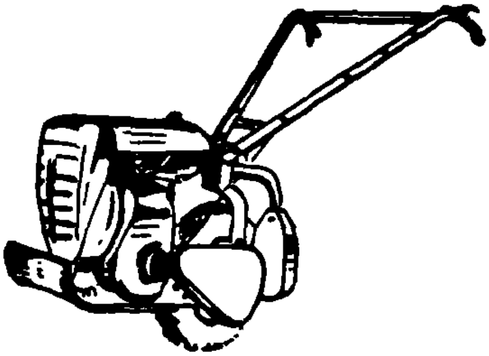

FIG. 13

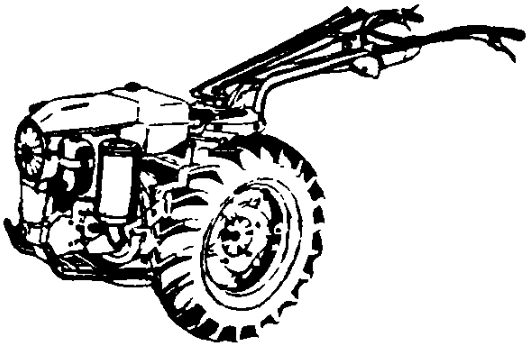

FIG. 14

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